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## MIGRATION OF *HIPPARCHIA SEMELE* L.

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### ABSTRACT

A migration has been recorded for the first time of the Grayling, (*Hipparchia semele* Linnaeus 1758) (Lepidoptera: Satyridae) in southern France. The migration occurred in the Cevennes mountains (north of Montpellier and west of Nîmes) in the commune of St. Martial (30440) from 3-7 September 1975. Details of the migration are given.

### METHOD

All results were taken from a 25m transect which was bounded on one side by an electricity pylon and on the other by a house. All butterflies passing between these two points were noted for five minute periods during four hours of observation. The observer was seated in a chair between the two points and was able to see oncoming insects. One hour of observations was made on the 4 September from 1045-1145 hrs, two hours on the 5 September from 1010-1110 hrs and 1300-1400 hrs and one hour on the 7 September from 1300-1400 hrs.

### RESULTS

**Start** The migration was first noticed on the 3 September when 48 *H. semele* were seen to come over the terrace of a house during a ten minute period from 1300 hrs. In retrospect there were plenty of *H. semele* around on the days previously but no attention was given to them.

**Direction** The insects were flying in a SE direction which was always constant. From the observation point it was possible to see the insects come down a steep slope then join a small track and continue up this until face to face with the observer. The insects continued past the observer and then descended another steep slope until out of sight. At the bottom of the slope the

insects would have come across a very steep mountainside, but it was not possible to determine whether they surmounted this obstacle (about 300m) or were deflected to the right and thus out of the valley to the south.

*The Front* It was not possible to determine exactly the true extent of the front. However, from where the observations were made the passage of insects was in progress 1000m to the south and 50m to the east. Observations made from a motor vehicle between two villages 14k to the south and out of the mountain range, on 3 September between 1030-1100 hrs showed that *H. semele* was on the move southeastwards in enormous numbers. The insects were continually crossing the road in one direction between St. Hippolyte du Fort and Sauve, a distance of 7k. Again on the 5 September along the same road but between St. Hippolyte du Fort and Ganges (13k) the author witnessed *H. semele* continually moving across the road in vast numbers and going in the same direction. On the 8 September when the author was driving away from the region he noted that plenty of *H. semele* were still moving off the cols in a south easterly direction up to 50k to the north.

*Numbers* As Table 1 indicates there were large numbers of *H. semele* passing the 25m transect every five minutes. The maximum which passed in a five minute period was 28, and only on one occasion were there none recorded. The average number passing every five minutes for the four hour periods was 13. The total numbers of *H. semele* passing for the four hours were 228, 142, 189 and 37. No *H. semele* were seen to pass in the opposite direction at any time.

From 3-7 September the migration was seen to be in progress for 13½ hours as follows:

| Total period of migration<br>3-7 Sept. |           |                                 |
|--|-----------|---------------------------------|
| Date                                   | Time      | Number of hours<br>of migration |
| 3 September                            | 1000-1315 | 3.15                            |
| 4 September                            | 1045-1600 | 5.15                            |
| 5 September                            | 1000-1400 | 4.00                            |
| 7 September                            | 1300-1400 | 1.00                            |
| Total                                  |           | 13.30                           |

*Flight Habits* One of the outstanding features of the migration was that the *H. semele* would frequently come past in groups of two or three, and seemed to be 'chasing' each other. Occasionally groups of up to five would fly past. There would always be one or two groups of these insects passing during most five minute periods. The speed of the migrating insects was estimated to be about 10-11kph. Typically the flight direction was always constant and seemed 'purposeful'. The insects were never seen to pause to visit flowers and did not exhibit their characteristic habits familiar with the higher ground where they are plentiful, (i.e., they did not dart off on short flights and alight in some inconspicuous place). Insects travelling up the track would keep close to the ground at about 10cm above, except when they would rise over an obstacle such as a house which stood in their flight path. On many occasions *H. semele* was seen to rise over a massive spiralling swarm of 'midges' at the top of a lime tree (*Tilia* sp.) after having come over the rooftops of a house. Only very occasionally specimens of *H. semele* were seen to be flying at about 10-15m above the ground.

*Other Species* Drawn along with the migrating stream of *H. semele* there were seven other species of Lepidoptera of which the most common were the Common Blue (*Polyommatus icarus* Rott.) (117 spp.), and the Small White (*Pieris rapae* L.) (110 spp.). The other species involved were the Large White (*Pieris brassicae* L.), the Great Banded Grayling (*Brintesia circe* Fab.), the Wood White (*Leptidea sinapis* L.), the Small Copper (*Lycaena phlaeus* L.) and a Swallowtail (*Papilio machaon* L.). Two other insect orders were involved. Four dragonflies (Odonata, sp. unidentified) flew past in the same direction and many syrphids (Diptera) flew past at a very fast rate, probably about 16-24kph.

## DISCUSSION

The Genus *Hipparchia* has come under revision and has been scrutinised critically by Kudrna (1975), who has recently described a new species in Europe. It is hoped that the details presented in this present paper will serve to increase the knowledge on the migratory habits of *H. semele*.

*Abundance of H. semele* *H. semele* has been recorded as being common in the Parc des Cevennes, (which includes the commune of St. Martial) (Feltwell, in press), and is found throughout the Cevennes including Mt. Aigoual (1565m), on the Causse Noir to

the west and at Concoules where it occurs between 700-800m (Gaillard 1959).

It has been the frequent experience of the author that when visiting the many cols of the region (of up to 1500m) there are always many hundreds of *H. semele* flitting about which are disturbed with every step. They are always in company with thousands of blue and red winged locusts (*Oedipoda* spp.). Foodplants of *H. semele* are grasses, particularly *Deschampsia* and *Agropyron* (Higgins and Riley, 1973), of which there are plenty on the sheep grazed slopes.

A typical habitat in which the Grayling can be found has been eloquently described by Rowland-Brown (1909), though for a region just to the north of the Cevennes 'the stony approaches to the Causse (Lot) were hung with scented clematis, with a dense underwood of wild gooseberries, exuberant of thorns, but jewelled with tiny luscious gold and crimson fruits . . . *Satyrus alcyone* perhaps the most in evidence, but *Hipparchia semele* and *circe* running it close in point of numbers'.

*Evidence for migration.* Migration of *H. semele* has hitherto been unrecorded (Williams 1930, 1958), and indeed all other species of the same taxa are known to be non-migratory. However, 10 specimens collected (while sitting on the chair) from the migratory stream were positively identified by Kudrna as true *semele* on the basis of their genitalia and were definitely of the southern French form.

The data presented in this paper together with evidence from Baker's (1969) theory on the evolution of the migratory habit in butterflies, and observations made by the author and Kudrna in the past lend support to the view that *H. semele* does in fact migrate.

Baker (*loc. cit.*) in his assessment of the degrees of movement exhibited by the 68 species of British butterflies predicted that *H. semele* would be expected to show infrequent voluntary displacement (Group III of his classification). His prediction was based on analysis of three factors, a) the nearness of the larval foodplant sites, b) the diffuseness of adult and larval habitats and c) the frequency with which new foodplant sites arise.

Observations reported previously by Feltwell (1975) in the same region of France that 'at the end of August 1967 "hundreds" of "browns" were reported (by another) moving east over a mile stretch of road above the village of St. Martial', may have also been migratory movements of *H. semele*.

Furthermore Kudrna (1974 and *pers. comm.*) observed in the Sierra de Alfacar (1500m) in southern Spain (Province of Granada) during 3-5 July 1973 *H. semele subcinerea* Ribbe flying 'down the hill' all going in one direction and following a mountain track bordered by a thin pine wood. The number of butterflies in this migration was not large and at the time Kudrna was not of the opinion that it was a migration. This latter point would tend to support what was observed in the Cevennes. Only after quantitative data is accumulated does the significance of a thin trickle of insects become more apparent. The division between movements and migrations has not been clearly defined and possibly other reports or observations, whether published or unpublished, of *H. semele* will come to light to clarify this position.

The intensity of the migration when measured on the seven point scale of Williams (1958 p. 103) would appear to fall between Division III and IV, i.e., III "Thin, should be obvious to any competent field naturalist" and IV "Definite, obvious to any normal person". Williams (*loc. cit.*) quoted as an example of III a migration of Large White Butterflies which passed through Harpenden during July-August 1940 when the insects were crossing a 100 yard front at a maximum of 12 per minute. The average number of *H. semele* passing over a front measured as 100 yards in this case compared closely with Williams' example, at 11 per minute. However, the maximum recorded over the 25m transect in any five minute period was 28 which would be equivalent to 31 per minute over a 100 yard front.

Thus one of the important features of the migration was that it was diffuse. To the casual onlooker it had to be pointed out in order to be seen and then it was fairly obvious. Such a diffuse migration could lead to a dispersal of 'thousands' of insects if the migratory stream was kept up for a long time and if the front was wide. Unlike other migratory lepidoptera where clouds of insects are involved, the migratory stream was always a regular trickle coming from the same direction. It is perhaps worth mentioning that a migration of *P. brassicae*, involving probably a million butterflies during a two day period in Finland in 1963 was progressing at its best at a rate of 10-20 individuals past a 50m transect every 10 minutes (Vepsäläinen 1963), thus representing a much more diffuse migration than recorded here for *H. semele*.

Lateness of the season may be a factor which is favourable for the migration in the Grayling. Gaillard (1959) mentioned

that *H. semele* is out from 30 June to 25 August and Higgins and Riley (1973) quote July and August. The summer of 1975 was particularly hot and dry, especially the first week of August when the continent suffered a heatwave. A similar late migration of *P. brassicae* was observed in SW France in 1963, and here the insects were flying southwards from 16-30 September (Angelade *et al*, 1963).

*Quantitative considerations.* Although the migration was in progress for 13½ hours throughout most of the warmest parts of the days concerned only four hours of almost continuous observations were carried out. There did not appear to be more insects flying at noon and from inspection of the results, where temperatures were taken, there did not appear to be more insects moving when the temperatures were at their highest.

From the observations already quoted in this communication it is clear that *H. semele* was moving at different times and different places over a front of at least 64k, i.e., between the two most distant points of observation. However, there was no way to determine whether the migration was continuous throughout the entire length of this front.

It would be foolish to make any kind of quantitative assessment of how many insects were involved in this migration beyond the limits of the experimental work; one of the practical limitations being the inability of the observer to be in all places at the same time. However, it is sufficient to note that the migration was in evidence at St. Martial for a total of 13½ hours and that during four of these hours 596 *H. semele* were recorded past a 25m transect. The immediate width of the front was about 1500m and there is some evidence that the front could have been as wide as 64k. The overall impression therefore was of a migration of *H. semele* moving down from their breeding sites on the cols and dispersing southeastwards towards the Garrigue of Nîmes and Montpellier.

*Other species.* The influence of migrating *H. semele* on other species of butterfly appeared to be quite considerable. During the four hours of observation 264 specimens of seven other species were drawn along, representing 44% of the total number of *H. semele* migrating. Approximately equal numbers of *P. icarus* and *P. rapae* passed during this period. The population of *P. icarus* is extremely large in this area and it was not surprising to find plenty of this species involved in the migration.

An interesting point about the direction of flight of all these insects was that it was definite; a characteristic also noted for

*P. brassicae* by Angelade *et al* 1963. They also found that migrating Large Whites did not pause to visit flowers, similar indeed to observations in this migration. Of the 860 specimens of all species recorded past the 25m transect only one specimen, that of a Painted Lady (*Vanessa cardui* L.) was recorded going in the opposite direction; and it was curious that this was the only specimen of a species which is documented with a marked migratory habit.

It is to be hoped that the data expressed in this paper will stimulate others to take a closer look at movements of insects, particularly diffuse ones, so that a better understanding between movements and migrations can be appreciated.

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TABLE 1

Movement of *H. semele* and other species across  
a 25m transect

| Date and Time | Temperature<br>°F | <i>H. semele</i> | <i>P. icarus</i> | <i>P. rapae</i> | Other spp. |
|---------------|-------------------|------------------|------------------|-----------------|------------|
| 4 Sept.       |                   |                  |                  |                 |            |
| 1045          | 76                | 8                | 0                | 2               | 0          |
| 1050          |                   | 16               | 1                | 1               | 1          |
| 1055          |                   | 20               | 2                | 3               | 3          |
| 1100          |                   | 13               | 5                | 1               | 2          |
| 1105          |                   | 28               | 1                | 1               | 1          |
| 1110          |                   | 17               | 3                | 1               | 1          |
| 1115          |                   | 22               | 1                | 1               | 2          |
| 1120          |                   | 17               | 1                | 0               | 1          |
| 1125          | 78                | 26               | 1                | 0               | 0          |
| 1130          |                   | 27               | 1                | 3               | 0          |
| 1135          |                   | 15               | 4                | 2               | 1          |
| 1140          |                   | 19               | 3                | 3               | 0          |
| Total         |                   | 228              | 23               | 18              | 12         |
| 5 Sept.       |                   |                  |                  |                 |            |
| 0945          | 74                | 0                | 0                | 0               | 0          |
| 1010          | 75                | 9                | 0                | 3               | 0          |
| 1015          |                   | 7                | 0                | 2               | 0          |
| 1020          |                   | 9                | 2                | 4               | 0          |
| 1025          |                   | 10               | 3                | 3               | 1          |
| 1030          |                   | 11               | 3                | 2               | 0          |
| 1035          | 77                | 8                | 2                | 2               | 0          |
| 1040          |                   | 13               | 5                | 2               | 0          |
| 1045          |                   | 10               | 2                | 1               | 0          |
| 1050          |                   | 12               | 3                | 1               | 0          |
| 1055          |                   | 13               | 2                | 3               | 1          |
| 1100          | 74                | 19               | 3                | 0               | 1          |
| 1105          |                   | 21               | 1                | 1               | 1          |
| Total         |                   | 142              | 26               | 24              | 4          |

TABLE 1 (continued)

|       |    |    |   |   |
|-------|----|----|---|---|
| 1300* | 20 | 5  | 4 | 0 |
| 1305  | 11 | 7  | 3 | 0 |
| 1310  | 16 | 4  | 3 | 2 |
| 1315  | 20 | 10 | 3 | 0 |
| 1320  | 16 | 4  | 3 | 2 |
| 1325  | 22 | 7  | 3 | 2 |
| 1330  | 23 | 2  | 3 | 4 |
| 1335  | 20 | 5  | 5 | 3 |
| 1340  | 24 | 4  | 3 | 0 |
| 1345  | 8  | 4  | 3 | 1 |

|         |     |              |     |    |
|---------|-----|--------------|-----|----|
| 1350    | 2   | 2            | 2   | 3  |
| 1355    | 7   | 4            | 5   | 2  |
| Total   | 189 | 58           | 40  | 19 |
| 7 Sept. |     |              |     |    |
| 1300*   | 5   | 1            | 4   | 2  |
| 1305    | 9   | 3            | 3   | 2  |
| 1310    | 8   | 1            | 2   | 0  |
| 1315    | 4   | 1            | 3   | 2  |
| 1320    | 5   | 2            | 2   | 2  |
| 1325    | 2   | 0            | 2   | 0  |
| 1330    | 0   | 0            | 0   | 0  |
| 1335    | 2   | 1            | 3   | 0  |
| 1340    |     | Not recorded |     |    |
| 1345    |     | Not recorded |     |    |
| 1350    |     | Not recorded |     |    |
| 1355    | 2   | 1            | 3   | 0  |
| Total   | 37  | 10           | 22  | 8  |
| Overall |     |              |     |    |
| Total   | 596 | 117          | 104 | 43 |

\* Temperature not recorded for this hour.